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EVALUATION OF PINYON PINE MORTALITY AT CHIMNEY PEAK AREA, BUREAU OF LAND MANAGEMENT

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ABSTRACT

Pinyon pine mortality on Bureau of Land Management land in the Chimney Peak area was diagnosed as being caused by black stain root disease. Heavy mortality is occurring in stands of almost pure singleleaf pinyon pine. Pinyon pine blister rust was seen causing mortality of young pinyon pine along a creek bottom northwest of the Chimney Peak fire station. Three alternatives are suggested as methods of dealing with the root disease. These are 1) do nothing, 2) salvage current mortality and 3) salvage dead and dying trees and cut out a buffer zone around the infection center.

In response to a request for a field evaluation, Dick Smith, Forest Pest Management pathologist, met with Patty Bates, Kathy Quimby, and Russ Lewis from the Bureau of Land Management, Bakersfield, to evaluate pinyon pine (Pinus monophylla) mortality occurring in the Chimney Peak Area, northeast of Walker Pass in the southern Sierra Nevada. The Bureau previously had sent in root samples from dead and dying pinyon pines, in which Forest Pest Management pathologists had found the fungus Ceratocystis wageneri, the cause of black stain root disease.

OBSERVATIONS

In a helicopter flight over the Chimney Peak Area extensive areas of pinyon pine mortality could be seen. The intensity of tree mortality varied from area to area, but the typical root disease mortality pattern, of groups of dead and dying trees in "centers" or pockets, was evident in most of the mortality areas we looked at. In some areas the

mortality was quite heavy. The fact that conifer stands in this area are pure pinyon pine and contained either no or few resistant tree species such as western juniper, is resulting in the complete loss of tree cover in these infection centers. The local Bureau of Land Management managers indicate that there has been a significant intensification of pinyon pine mortality within the last 2 to 4 years. During the flight we also noted some pockets of dead and dying Coulter pine which from the air had the characteristics of root disease centers. A ground check of one group of dead Coulter pine at lower elevations along the Canebrake Road showed that western dwarf mistletoe and California flatheaded borers were the cause of death. It still would be worthwhile to check some of the groups where they are close to the black stain infestation of pinyon pine.

We confirmed the presence of black stain root disease in some of the closer, more accessible stands, where the mortality was clumped in groups or centers. The affected stands were generally overmature and overstocked (before the root disease started to open them up), and almost pure pinyon pine. A moderate amount of natural pinyon pine reproduction was present in the older openings created by the root disease. In some cases, these younger trees were also infected by the black stain root disease.

We also stopped and looked at a large area where the pinyon pine had been removed and some scattered pine regeneration had seeded into the area. The surrounding stand had a moderate to heavy infestation of black stain and the local managers indicated that the cleared area probably had been infested before clearing. The scattered pinyon pine saplings now growing in this area showed no signs of the root disease.

At one spot alongside the road (T23S, R37E, Sections 35 and 36) we noted frequent branch killing without the general tree decline typical of a root disease. Examination of the dead and dying branches revealed the presence of pinyon pine blister rust caused by the rust Cronartium occidentale. The pines with rust were mainly concentrated along a stream bottom, but did extend up the north side of the drainage for about 50 yards. The rust was also seen on the alternate host, Ribes in the area.

BIOLOGY OF THE PEST ORGANISMS

Black Stain Root Disease

This root disease is caused by the fungus Ceratocystis wageneri (Verticicladiella wagenerii). In California it is found attacking several species of pines and Douglas-fir causing a wilt type of disease. In those areas where it has been found attacking singleleaf pinyon pine no other conifers have been affected. In particular, western juniper, a tree commonly found in association with pinyon pine, is resistant to this disease. Hardwood trees and shrubs are also unaffected. This disease attacks the roots and root collars of pinyon pine, imparting a dark black stain to the affected xylem. The disease spreads locally from tree to tree by root contact causing the development of root

disease centers. Long distance spread is most likely accomplished by means of an insect vector, but this has yet to be confirmed. The pathogen does not live for long periods in the dead trees and stumps as do many other root disease-causing fungi. The exact length of time it takes the fungus to die after the tree dies is unknown, but it is most likely less than 2 years.

Pinyon Pine Blister Rust

This disease is caused by the obligately parasitic rust fungus Cronartium occidentale. It has the same life cycle as white pine blister rust except that the pine host species is different. Ribes species are the alternate hosts and the fungus must alternate between the Ribes and pine hosts in order to complete its life cycle. It has five different spore stages which have rather exacting microclimatic requirements. In the Sierra Nevada moisture is usually the limiting factor and hence infestations are often found along creek bottoms or similar areas of greater than normal atmospheric moisture. On pine, the rust fungus infects the needles and from there grows down into the twigs and branches causing a canker. The fungus sporulates on these branches each spring and early summer producing masses of orange-colored spores. The fungus grows slowly down the branches to the main stem where it slowly girdles the stem and kills the portion of the tree distal to the girdle. Pinyon pine blister rust appears to act much slower than white pine blister rust and is slow to kill larger, more mature trees, although young trees can be quickly killed.

MANAGEMENT ALTERNATIVES

1. Do Nothing. In this alternative no action to manage the pest-caused losses will be taken. The root disease centers will continue to enlarge as the trees on the margin become infected and die. The rate of local spread of the root disease will vary from center to center, but the average will be about 2 to 4 feet radially per year. The root disease in a few centers will become inactive as the fungus dies out because of the lack of transmission to new live hosts. Most centers will remain active. Seedlings and saplings which become established at the margins of the infection centers will also become infected and die. Young trees established in the center of larger, older infections may well escape infection since they are in an area where the living fungus is no longer present. But, in those areas where the infestation is severe, most of the stand will gradually be killed in time. The blister rust will continue to affect the trees in the stream bottoms and may complicate the conversion of the older stand to a younger one by killing the new regeneration.

2. Remove dead and dying pinyon pine. The harvesting of the dead and dying trees for fuelwood or other purposes will more fully utilize the resources of the area, but will not affect the progress of the root disease.

3. Remove dead and dying pinyon pine plus a 75-foot buffer around each infection center. This will result in more complete utilization with fewer entries, and the root disease will die out in the existing centers with no available living hosts to infect. This will not stop the establishment of new centers. Two to three years after the centers and buffer strips are cleared they could be regenerated to pinyon pine. If the area is to be planted, juniper could be introduced as insurance against complete loss of the stand in future epidemics.